

## CLAIMS

What is claimed is:

1. An illustrative demonstration apparatus for use in storing information in a memory, the apparatus comprising:

a reusable panel for temporary display of user-drawn marks;

a digitizer for generating digital information corresponding to the user-drawn marks; and

an indexer for associating the digital information with a header,

wherein the header is based at least in part on a selected portion of the user-drawn marks selected by the user.

2. The apparatus of claim 1, wherein the reusable panel corresponds to a whiteboard panel for use with temporary markers dispensing erasable ink.

3. The apparatus of claim 2, wherein the digitizer corresponds to a scanner for scanning whiteboard notes from the whiteboard panel.

4. The apparatus of claim 3, wherein the selected portion of the user-drawn marks corresponds to a circled region of the whiteboard notes.

5. The apparatus of claim 4, wherein the indexer uses an indexing method, the method comprising:

extracting a circled region of the whiteboard notes using circled region extraction;

constructing a header based at least in part on the circled region; and

associating the digital information as data with the header as metadata.

6. The apparatus of claim 5, wherein the user-drawn marks contain plural circled regions, wherein every circled region is extracted, wherein headers are constructed for each circled region, and wherein the digital information is associated as data with each header as metadata.

7. The apparatus of claim 5, wherein the indexing method further comprises the step of removing a circle from the circled region, and wherein the header is based at least in part on the circled region from which the circle has been removed.

8. The apparatus of claim 7, wherein the indexing method further comprises the step of constructing recognized text using handwriting recognition on the circled region from which the circle has been removed, and wherein the header is based at least in part on the recognized text.

9. The apparatus of claim 1, wherein said reusable panel has a redisplay capability permitting redisplay of the user-drawn marks on the reusable panel based on the digital information.

10. The apparatus of claim 9, wherein the redisplay capability stems from a plotter operably coupled to said reusable panel.

11. The apparatus of claim 9, further comprising an active display for display of a plurality of headers, wherein associated digital information that is digital information associated with a header is concurrently displayed on said active display with the header upon selection of the header by a user.

12. The apparatus of claim 11, wherein the associated digital information is displayed on the reusable panel via the redisplay capability as machine-drawn marks at an option of the user, and wherein the machine drawn marks resemble the user-drawn marks from which the associated digital information was generated.

13. The apparatus of claim 7, wherein the step of removing the circle from the circled region employs a circle removal method, the method comprising:

- moving a scan line in a plane of the circle region in a first direction;
- scanning the circled region in a second direction, wherein the second direction lies in a complementary fashion to the first direction in the plane of the circled region;
- detecting non-background pixels within the scan line corresponding to the circle; and
- erasing the non-background pixels.

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14. The apparatus of claim 13, wherein the circle removal method further comprises:

detecting a first non-background pixel within the scan line, wherein the first non-background pixel corresponds to the non-background pixel first detected in a first linear scan of all pixels in the scan line;

detecting a first background pixel within the scan line, wherein the first background pixel corresponds to the background pixel first detected after detection of the first non-background pixel in the first linear scan of all pixels in the scan line;

detecting a second non-background pixel within the scan line, wherein the second non-background pixel corresponds to the non-background pixel last detected in the first linear scan of all pixels in the scan line;

detecting a second background pixel within the scan line, wherein the second background pixel corresponds to the background pixel first detected in a second linear scan of pixels in the scan line, wherein the second linear scan starts at the second non-background pixel and proceeds in a direction opposite to the first linear scan;

removing the first non-background pixel;

removing all non-background pixels between the first non-background pixel and the first background pixel;

removing the second non-background pixel; and

removing all non-background pixels between the second non-background pixel and the second background pixel.

15. The system of claim 14, wherein there exists only one circle in each circled region, wherein the circle is a concave curve that is at least one of closed and near closed, and wherein speckle noise has been removed from the circled region via preprocessing.

16. An indexing method for use with an index and retrieval system for scanned notes from whiteboard, the method comprising:

extracting a selected portion of user-drawn marks, wherein the selected portion is selected by a user;

constructing a header based at least in part on the selected portion; and

associating digital information as data with the header as metadata,

wherein the digital information is generated at least in part from the user-drawn marks.

17. The method of claim 16, wherein the user-drawn marks contain plural selected portions, wherein headers are constructed based at least in part on each selected portion, and wherein the digital information is associated as data with each header as metadata.

18. The method of claim 16, wherein the selected portion of the user-drawn marks corresponds to a marked-up region, wherein the indexing method further comprises the step of removing mark-up from the marked-up region, and wherein the header is based at least in part on the marked-up region from which mark-up has been removed.

19. The method of claim 18, the method further comprising the step of constructing recognized text using handwriting recognition on the marked-up region from which the mark-up has been removed, and wherein the header is based at least in part on the recognized text.

20. A retrieval method for use with an index and retrieval system, the method comprising:

displaying index information associated with metadata, wherein the metadata indexes data corresponding to digital information generated from user-drawn marks, and wherein the metadata corresponds to a header based at least in part on a selected portion of the user-drawn marks; and

displaying the user-drawn marks in response to user-selection of the index information.

21. The method of claim 20, wherein the user-drawn marks correspond to whiteboard notes, wherein the selected portion corresponds to a circled region, wherein the index information is a header corresponding to at least one of an image of the circled region and recognized text from within the circled region, and wherein the whiteboard notes associated with the header are concurrently displayed on the active display when the header is selected.

22. A whiteboard apparatus, the apparatus comprising:

a reusable panel for visual display of whiteboard notes, upon which whiteboard notes are written with whiteboard pens dispensing erasable ink; and

a plotter for plotting machine-drawn marks onto said reusable panel using at least one whiteboard pen dispensing erasable ink, wherein the whiteboard notes are plotted based on digital information stored in memory, and wherein said digital information corresponds to user-drawn marks.



23. A mark-up removal method for use with an index and retrieval system, the method comprising:

moving a scan line in a plane of an image in a first direction;

scanning the marked-up region in a second direction, wherein the second direction lies in a complementary fashion to the first direction in the plane of the image;

detecting non-background pixels within the scan line corresponding to mark-up of the image; and

erasing the non-background pixels.

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24. The method of claim 23, method further comprising:

detecting a first non-background pixel within the scan line, wherein the first non-background pixel corresponds to the non-background pixel first detected in a first linear scan of all pixels in the scan line;

detecting a first background pixel within the scan line, wherein the first background pixel corresponds to the background pixel first detected after detection of the first non-background pixel in the first linear scan of all pixels in the scan line;

detecting a second non-background pixel within the scan line, wherein the second non-background pixel corresponds to the non-background pixel last detected in the first linear scan of all pixels in the scan line;

detecting a second background pixel within the scan line, wherein the second background pixel corresponds to the background pixel first detected in a second linear scan of pixels in the scan line, wherein the second linear scan starts at the second non-background pixel and proceeds in a direction opposite to the first linear scan;

removing the first non-background pixel;

removing all non-background pixels between the first non-background pixel and the first background pixel;

removing the second non-background pixel; and

removing all non-background pixels between the second non-background pixel and the second background pixel.

25. The method of claim 23, wherein the mark-up is a user drawn circle, wherein there exists only one circle in each marked-up region, wherein the user drawn circle is a concave curve that is at least one of closed and near closed, and wherein speckle noise has been removed from the marked-up region via preprocessing.

25. The method of claim 23, wherein the mark-up is a user drawn circle, wherein there exists only one circle in each marked-up region, wherein the user drawn circle is a concave curve that is at least one of closed and near closed, and wherein speckle noise has been removed from the marked-up region via preprocessing.